

Metabolic Cost Approach to Characterizing Advanced Spacesuit Mobility

Completed Technology Project (2013 - 2013)



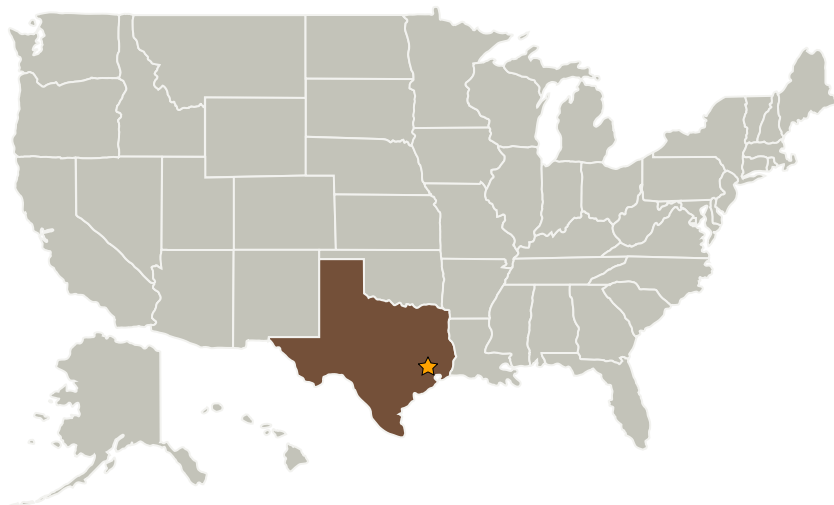
Project Introduction

Spacesuit mobility has been historically difficult to define and therefore, difficult to write requirements for. Most previous efforts have concentrated on establishing metrics for isolated joints – often multiple movements for each joint – and characterizing the range of motion of that joint – as well as the corresponding joint torque through said range of motion. However, there have been multiple issues with this approach: First, it has been shown through multiple tests at JSC that joint torque data lacks repeatability, even with the same test setup and subject; Second, a suit can often meet defined mobility requirements yet exhibit lackluster or anomalous mobility behavior (or vice versa); Third, defining mobility at the isolated joint level does not capture the mobility of the comprehensive suit system in real application, with multiple joints often working in harmony or in discord. Lastly, there lacks a standardized testing protocol with which JSC and suit contractors can assess suited mobility in a repeatable and predictable manner. The proposal contained herein aims to mitigate all of these problems through investigating a new method of suited mobility characterization: by measuring the relative metabolic cost associated with performing a series of functional tasks as compared to performing those same tasks in a shirtsleeve environment.

Anticipated Benefits

Enhanced spacesuit mobility characterization techniques enable future exploration missions and ensure that design success criteria is tied to functional exploration tasks. Feasibility of the approach has been verified and future testing with improved test protocols is currently in planning.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

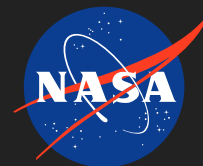
Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations
Texas

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Carlos H Westhelle

Project Manager:

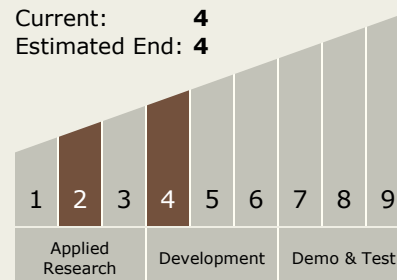
Shane M Mcfarland

Principal Investigator:

Shane M Mcfarland

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Technology Areas

Primary:

- TX04 Robotic Systems
 - TX04.2 Mobility
 - TX04.2.4 Surface Mobility